

THAT WHICH IS CLAIMED:

1. An apparatus for layup of a composite structure, the apparatus comprising:  
a mandrel defining a layup surface for receiving the composite structure thereon, the layup surface defining an inner portion generally corresponding to a desired contour of the composite structure and a grip feature disposed on the layup surface and extending at least partially around the inner portion,  
wherein the grip feature defines a retaining surface configured to retain the composite structure in a predetermined configuration during manufacture.
2. An apparatus according to Claim 1 wherein the grip feature extends continuously around the inner portion of the layup surface.
3. An apparatus according to Claim 1 wherein the retaining surface is generally perpendicular to the layup surface and defines an edge with the layup surface, the retaining surface and the edge configured to engage the composite structure.
4. An apparatus according to Claim 1 wherein the grip feature defines a bottom portion extending outward from the retaining surface to a periphery of the mandrel.
5. An apparatus according to Claim 1 wherein the grip feature defines a depth of between about 0.1 inch and 0.5 inch.
6. An apparatus according to Claim 1 wherein the grip feature defines a boundary of the inner portion having a shape generally corresponding to the desired shape of the composite structure.
7. An apparatus according to Claim 1 wherein the layup surface defines an outer peripheral portion outward of the inner portion and wherein the grip feature is a grip groove disposed in the layup surface and defining a boundary between the inner portion and the outer peripheral portion of the layup surface.

8. An apparatus according to Claim 7 wherein the grip groove defines a tapered portion extending at least partially between the retaining surface and the outer peripheral portion.
9. A method for retaining a composite structure during manufacture thereof, the method comprising:
- providing a mandrel having a layup surface for receiving the composite structure thereon, the layup surface having an inner portion and a grip feature defining a retaining surface extending at least partially around the inner portion;
  - assembling on the layup surface of the mandrel a composite preform in the shape of the composite structure, the preform having at least one resinous laminate and at least two tiedown plies; and
  - adhering at least one of the tiedown plies to the mandrel with the film adhesive applied at the grip feature such that the tiedown ply is retained by the grip feature in a predetermined configuration,
- wherein the film adhesive is characterized by a cure temperature lower than a cure temperature of the resin of the laminate.
10. A method according to Claim 9 wherein said providing step comprises forming the grip feature to extend continuously around the inner portion of the layup surface.
11. A method according to Claim 9 wherein said providing step comprises forming the retaining surface generally perpendicular to the layup surface to define an edge with the inner portion of the layup surface, such that the retaining surface and the edge are configured to retain the composite structure.
12. A method according to Claim 9 wherein said providing step comprises forming the grip feature to define a depth of between about 0.1 inch and 0.5 inch.

13. A method according to Claim 9 wherein said providing step comprises forming the layup surface to define an outer peripheral portion outward of the inner portion and forming the grip feature as a grip groove disposed in the layup surface and defining a boundary between the inner portion and the outer peripheral portion of the layup surface.
14. A method according to Claim 9 wherein said assembling step comprises providing the laminate including bismaleimide matrix resin.
15. A method according to Claim 9 wherein said assembling step comprises providing a honeycomb core.
16. A method according to Claim 15 wherein said assembling step comprises providing a tiedown ply in contact with the core.
17. A method according to Claim 9 further comprising providing a film adhesive between the tiedown plies.
18. A method according to Claim 9 further comprising heating the composite preform to a first temperature between the cure temperature of the film adhesive and the cure temperature of the resin in the laminate, and subsequently heating the composite preform to a temperature at least as high as the cure temperature of the resin, such that the film adhesive is cured before the resin is melted.
19. A method according to Claim 9 further comprising trimming the preform along a trim line inward of the grip feature to form the composite structure.